Axial piston compressor,
especially a compressor for the air-conditioning system of a motor vehicle

Claims

1. Axial piston compressor, especially a compressor for the air-conditioning system of a motor vehicle, having a housing and, for drawing in and compressing a coolant, a compressor unit arranged in the housing and driven by means of a drive shaft (104), the compressor unit comprising pistons (118), which move axially back and forth in a cylinder block, and a tilt plate (swash plate or wobble plate; or tilt ring (107) which drives the pistons and rotates together with the drive shaft (104),
   characterised in that
   the geometry and dimensioning of all parts moved in translation, such as axial pistons (118), piston rods or sliding blocks (121, 122) or the like, on the one hand, and all parts moved in rotation, such as the tilt plate (107), members for conjoint movement or the like, on the other hand, are such that, for any desired tilt angles (α) of the tilt plate (107), especially between a predetermined minimum tilt angle (α_{min}) and a predetermined maximum tilt angle (α_{max}), the moment $M_{k,ges}$ due to the masses moved in translation, especially that of the pistons (118), where appropriate including sliding blocks (121, 122), piston rods or the like, is approximately equal to the moment M_{SW} due to the moment of deviation, that is to say the moment due to the mass inertia of the tilt plate (107).

2. Compressor according to claim 1,
   characterised in that
   the balancing of moments $M_{k,ges} = M_{SW}$ is set for a predetermined tilt angle (α), especially for the following tilt angles:
   $\alpha = (\alpha_{max} - \alpha_{min})/2$, or
   $\alpha = \alpha_{max}$,
   or even a predetermined virtual tilt angle
   $\alpha > \alpha_{max}$.

3. Compressor according to claim 1 or 2,
characterised in that
the centre of gravity of the tilt plate (107) is located on the tilt axis (x) thereof.

4. Compressor according to claim 1 or 2,
characterised in that,
given division of the space surrounding the drive shaft and the tilt plate into four quadrants (Q1, Q2, Q3, Q4), the centre of gravity of the tilt plate (107) is offset either into a first, front quadrant (Q1) delimited by the drive shaft (104) and the front face of the tilt plate (107) including the piston support and facing the pistons, or into a second, front quadrant (Q2) located on the side opposite the first quadrant (Q1) relative to the drive shaft (104), or into a third, rear quadrant (Q3) arranged relative to the tilt plate (107) at the height of the second quadrant (Q2) behind the tilt plate (107), that is to say on that side of the tilt plate (107) which is remote from the pistons, or into a fourth, rear quadrant (Q4) arranged relative to the tilt plate (107) at the height of the first quadrant (Q1) behind the tilt plate (107), that is to say on that side of the tilt plate (107) which is remote from the pistons.

5. Compressor according to one of claims 1 - 4,
characterised in that
it is down-regulatable in the relatively high speed of rotation range and up-regulatable in the relatively low speed of rotation range (Figs. 15a, 16, 17, 18).

6. Compressor according to claim 4 or 5,
characterised in that
the location of the centre of gravity moves, with a change in the tilt angle of the tilt plate (107), from an up-regulating quadrant (Q2, Q4) into a down-regulating quadrant (Q1, Q3) or *vice-versa*.

7. Compressor according to one of claims 1 to 6,
characterised in that
the piston stroke and/or the tilt angle of the tilt plate (107) is substantially constant in the case of changes in the speed of rotation.

8. Compressor according to one of claims 1 to 7,
characterised in that
the speed-of-rotation-dependent characteristic curves of the drive mechanism chamber pressure difference (p), relative to the suction pressure, set against the tilt angle (α) of the tilt plate (107) either intersect at one point or converge at one point.

9. Compressor according to claim 8,
characterised in that
the point of intersection of the characteristic curves separates the up-regulating from the down-regulating speed of rotation range.

10. Compressor according to one of claims 1 to 9,
characterised in that
the characteristic curves (regulation curves) for different speeds of rotation run approximately parallel to one another.

11. Compressor according to one of claims 1 to 10,
characterised in that
the tilt angle (α) of the tilt plate (for example, tilt ring 107) changes by about 2° to 4° in the event of a change in the speed of rotation from minimum to maximum, especially under the condition of an approximately constant pressure in the drive mechanism chamber.

12. Compressor according to one of claims 1 to 11,
characterised in that
the spring constant of the restoring spring (117) acting on the tilt plate (for example, the tilt ring 107) is between about 40 and 90 N/mm, especially about 40 to 70 N/mm, the selected spring constant having been optimised for a group of regulation characteristic curves.

13. Compressor according to one of claims 1 to 12,
characterised in that
the moment of deviation, taking into account a so-called Steiner component, includes both an up-regulating and a down-regulating term, those terms

predominating, in each case, after a threshold tilt angle (α_G) of the tilt plate (107) has been exceeded, especially, in the case of

$\alpha < \alpha_G$ in up-regulating manner, and

$\alpha > \alpha_G$ in down-regulating manner.